

CLAIMS

1. A multiple-input multiple-output (MIMO) wireless communications system comprising:

(i) a plurality of transmit antenna elements; and

5 (ii) a plurality of receive antenna elements;

wherein the transmit antenna elements are arranged to provide polarisation diversity and wherein the positions of the transmit antenna elements are arranged, such that spatial diversity is avoided.

10 2. A MIMO wireless communications system as claimed in claim 1 wherein each of said transmit antenna elements is polarised at one of two first substantially orthogonal polarisations.

3. A MIMO wireless communications system as claimed in claim 2 wherein each of said receive antenna elements is polarised at one
15 of two second substantially orthogonal polarisations.

4. A MIMO wireless communications system as claimed in claim 3 wherein said two first substantially orthogonal polarisations are different from said two second substantially orthogonal polarisations.

20 5. A MIMO wireless communications system as claimed in claim 1 wherein said plurality of transmit antenna elements comprises one or more dual-polar-elements each such dual-polar-element being two co-located antenna elements operable from a single antenna aperture.

25 6. A MIMO wireless communications system as claimed in claim 1 wherein said plurality of transmit antenna elements is provided by an antenna array.

7. A MIMO wireless communications system as claimed in claim 1 which is arranged to operate at a particular wavelength and
30 wherein the inter-element spacing of the transmit antenna elements is less than one of the particular wavelength.

8. A MIMO wireless communications system as claimed in claim 1 which is arranged to provide non-MIMO communications in addition to MIMO communications.
- 5 9. A MIMO wireless communications system as claimed in claim 1 wherein said transmit antenna elements are together arranged to provide a plurality of antenna beams in use.
- 10 10. A MIMO wireless communications system as claimed in claim 9 wherein said plurality of antenna beams are provided using one or more beamformers integral with the transmit antenna elements.
- 15 11. A MIMO wireless communications system as claimed in claim 9 wherein said plurality of antenna beams comprises pairs of antenna beams, each pair comprising a first antenna beam of a first polarisation and a second antenna beam, substantially identical to the first but provided at a second polarisation different from the first polarisation.
12. A MIMO wireless communications system as claimed in claim 11 wherein each of said pairs of antenna beams is arranged to provide a two-branch MIMO input.
- 20 13. A MIMO wireless communications system as claimed in claim 1 which is selected from a 2:2 and a 2:4 MIMO system.
14. A MIMO wireless communications system as claimed in claim 1 which is selected from a fixed wireless access system, a personal area network, a wireless local area network, and a mobile communications network.
- 25 15. A MIMO wireless communications system as claimed in claim 1 wherein each of said transmit antenna elements comprises a column of antenna elements.
16. A multiple-input multiple-output wireless communications method comprising the steps of:-
 - 30 (i) transmitting a space-time coded signal from a transmit antenna arrangement comprising a plurality of transmit

antenna elements arranged such that polarisation diversity is provided and spatial diversity is avoided; and

- (ii) receiving the space-time coded signal at a receive antenna arrangement comprising a plurality of receive antenna elements.

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17. A method as claimed in claim 16 which further comprises:

- (i) positioning the transmit antenna arrangement and the receive antenna arrangement such that a line of sight path is present between those two arrangements; and

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- (ii) using said transmit antenna arrangement to transmit the space-time coded signal to the receive antenna arrangement at least partly along said line of sight path.

18. A method as claimed in claim 16 which further comprises transmitting a non-space-time coded signal from the transmit antenna arrangement simultaneously with the space-time coded signal.

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19. An antenna arrangement for use in a multiple-input multiple-output (MIMO) wireless communications system, said antenna arrangement comprising a plurality of transmit antenna elements arranged to provide polarisation diversity and wherein the positions of said transmit antenna elements are such that spatial diversity is avoided.

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20. An antenna arrangement as claimed in claim 19 which is arranged to operate at a particular wavelength and wherein the inter-element spacing of the transmit antenna elements is less than one of the particular wavelength.

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21. An antenna arrangement as claimed in claim 19 which is also suitable for use in a non-MIMO communications system simultaneously with use in the MIMO communications system.

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22. A method of operating an antenna arrangement as claimed in claim 19 which comprises transmitting space-time coded signals from said antenna arrangement.

23. A method of operating an antenna arrangement as claimed in claim 19 which further comprises a plurality of receive antenna elements and wherein said method comprises receiving space-time coded signals at said antenna arrangement, said signals being polarisation diverse and having a substantially insignificant amount of spatial diversity.
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